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Tornado slams IPS's Neal 4 generating station: rebuilding and repair could take up to a year

SIOUX CITY, IA—It could take Iowa Public Service up to a year to get the Neal 4 generating station back on line following a tornado that smashed into the plant at the end of July. Damages were estimated to total as much as $50-million.

Neal 4 is owned jointly by 14 investor-owned utilities, rural electric cooperatives and municipalities in Iowa and South Dakota. Iowa Public Service owns 40.57 percent, the largest single share, and operates the unit. It is the largest generating unit on the IPS system and in 1985 experienced the best operating year in its seven-year life.

Extensive damage

According to company president Russ Christiansen, the storm was "the most destructive thing I've ever seen."

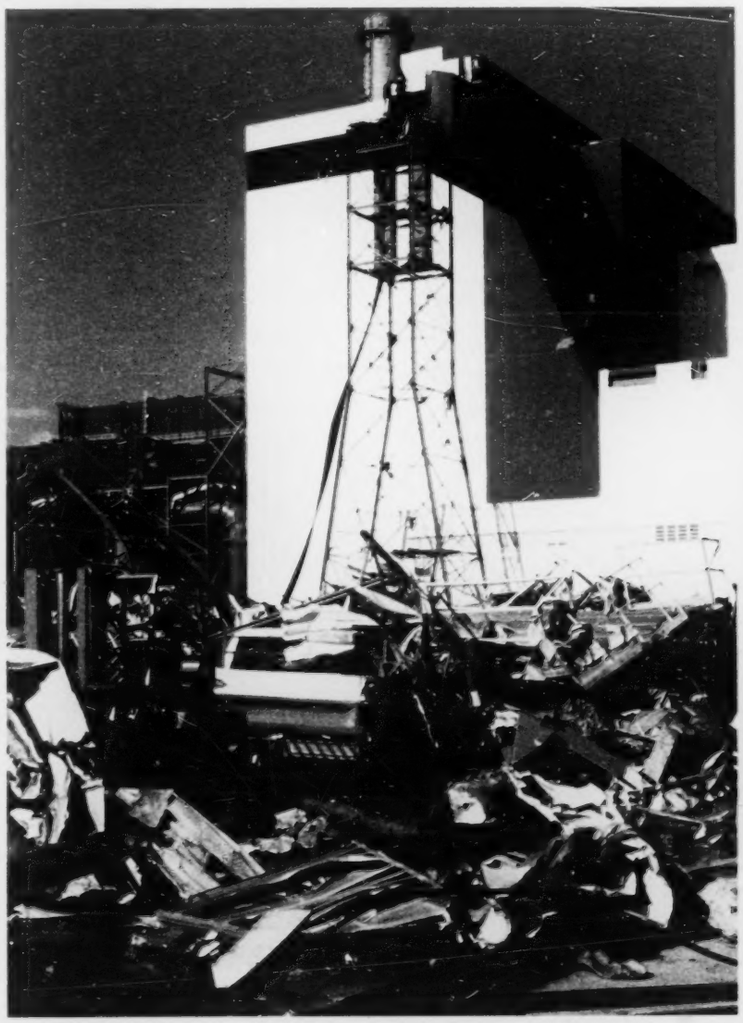
The plant sustained serious damage as winds tore off roof sections over the turbine building and control room. The coal handling system was totally demolished. The Central Storeroom building was destroyed and some $6-million worth of parts had to be sifted from the remains, identified and tagged for use again. The Neal substation was damaged and a connecting 161-kV transmission line lost 18 structures.

No serious injuries or deaths

Fortunately, none of the eight workers in the plant were hurt when the storm hit. The only casualty was a Wells Fargo security guard who sought shelter in the guardhouse and suffered a slight cut on the head.

Cleanup activities began as soon as the storm passed the plant. One of the

Continued on page 6



Tornado that ripped into Iowa Public Service Company's Neal station destroyed the coal handling system, damaged a substation and left the area strewn with rubble. Roof sections were blown off several parts of the plant, including the control room, causing interior damage also.

Nuclear industry leaders call for self-improvement, changes

BARRINGTON, IL—A group of nuclear industry leaders has issued a report calling for the U.S. nuclear utility industry to take the initiative in improving its performance record and public image.

The Utility Nuclear Power Oversight Committee (UNPOC), which is made up of past and present utility nuclear executives and other industry experts, says its self-examination represents a major effort aimed at further improving the safe and reliable operation of nuclear units in the U.S.

Absolutely essential

"Quality operational performance of all U.S. nuclear utilities is absolutely essential for public and regulatory trust," states the report.

Conducted by a task committee of UNPOC, the report addresses three main questions. The committee looked into: 1.) how nuclear plant operating performance can be improved; 2.) how the industry's relationship with the Nuclear Regulatory Commission can be improved; and, 3.) establishing a unified nuclear utility industry group.

Members of the UNPOC committee included Chairman Lelan F. Sillin, Jr., former chairman and CEO of Northeast Utilities; Vice Admiral Eugene P. Wilkinson USN (ret.), former president and CEO of the Institute of Nuclear Power Operations (INPO); and, Marcus A. Rowden, former chairman of the NRC. In conducting research for the report, they met with utility CEOs, regulatory commissioners and staff, and various industry groups.

The report, *Leadership in Achieving Operational Excellence: The Challenge For All Nuclear Utilities*, points out that as of July 1, 101 nuclear plants were licensed for operation and an additional 21 are under construction.

According to the committee, "...industrywide exemplary performance is the single most important factor if the nuclear utility industry is to achieve and maintain public and regulatory confidence and trust. Further, such performance is essential if the utility industry is to gain the credibility necessary for greater reliance to be placed on industry self-improvement initiatives."

NRC support

NRC Chairman Lando W. Zech, Jr. said he strongly supports the industry initiative. "I believe that this nuclear utility industry commitment for self-improvement is a most commendable effort, and in my judgement," he remarked, "one of the most important initiatives the industry has ever undertaken."

As to improving the operational performance of the plants, the committee said there are two areas where the industry and INPO are being challenged.

The committee said that the overall performance record of the U.S. nuclear industry has not compared favorably to performance of similar plants being operated in Germany, France,

Continued on page 11

Read about 1986's Utility of the Year in the Nov. EL&P

Virginia Power dedicates first U.S. aboveground waste storage facility

SURRY, VA—Officials from the U.S. Dept. of Energy and Virginia Power dedicated Aug. 26 the first aboveground facility in the U.S. licensed to store high-level spent nuclear fuel.

The facility is located at Virginia Power's Surry power station. Utility Chairman William W. Barry and DOE's Director of the Office of Civilian Radioactive Waste Management Ben C. Rusche presided over the ceremonies.

First to need more storage

"We're the first utility to need more on-site storage," noted Berry, "but about half the utilities in the country will also need additional space before permanent storage is available."

DOE's Rusche said in his prepared remarks, "The significance to the nation of today's dedication of this facility is that spent fuel from commercial power reactors can be stored at reactor sites in a safe, economical and environmentally acceptable manner both in pools and in dry casks. This new step adds confidence that nuclear utilities will be able to continue to operate while the siting, design, construction and operation of the integrated waste disposal system for long-term, permanent disposal is being developed."

Virginia Power said the dry storage

Continued on page 12

News Briefs

JILL MINNER, Editorial Assistant

NY Power Authority to finance study of prehistoric fossils

● According to the New York Power Authority, rock extracted during construction of its Blenheim-Gilboa Pumped Storage Project has provided scientists with 380 million year-old fossils of plant and animal life. The Power Authority said it is contributing $125,000 for a team of biologists and geologists to study the fossil-bearing rocks. "Besides looking at the remains of specific plants and animals, we'll be using the fossils and sedimentary rocks to determine what the entire ecosystem was like," said Dr. Patricia Bonamo, professor of biological sciences at SUNY-Binghamton and head of the research team.

KG&E's Wolf Creek sets first year power production record

According to the Atomic Industrial Forum, Inc. (AIF), Kansas Gas & Electric Co.'s Wolf Creek nuclear generating station set a new U.S. record for first-year commercial power production when it passed the 8.699 billion MWh mark, surpassing the record set in May by Pacific Gas and Electric Co.'s Diablo Canyon Unit 1. AIF said other first-year record performers included Union Electric Co.'s Callaway, which generated 8.475 billion MWh, and Public Service Electric and Gas Co.'s Salem 2, which produced 8.380 billion MWh.

DOE completes Mod-2 wind turbine research program

● Experimental operation and research on three, 2500-kW wind turbines has been successfully completed, according to the Department of Energy (DOE). DOE said the Mod-2 turbines combine a failsafe shutdown protection system, a soft (less rigid) steel tower and a rotor with acceptable noise levels. Boeing Aerospace Co. designed, built and installed the machines under a program managed first by the National Aeronautical and Space Administration and now by the Solar Energy Research Institute. DOE expects sale of the turbines to take place in early 1987. "In the meantime," said Assistant Secretary for Conservation and Renewable Energy Donna R. Fitzpatrick, "the machines will continue to be operated on a reduced schedule for the remainder of the year."

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EL&P readers whose responsibilities include both Generation and Transmission/Distribution receive both technology sections. Other readers receive the technology section that applies to their respective area of responsibility. The Generation edition is indicated by a single dot (•) in the upper right corner of page 1; the T/D edition carries two dots (••). All readers receive EL&P's industry news section.

New Hampshire Yankee asks NRC for zero-power license

● New Hampshire Yankee said it has asked the U.S. Nuclear Regulatory Commission for permission to load Seabrook Station's reactor with fuel and to conduct a month-long series of tests without starting up the reactor. According to the company, construction of the plant is complete and ready for low-power testing of the reactor, however a recent decision by the NRC's Atomic Safety and Licensing Board to re-open some 1983 hearings has delayed the issuance of a low-power license. George S. Thomas, New Hampshire Yankee vice president for nuclear production, said "We want to use the time during this delay to perform a series of 'zero-power' tests...[which] would be conducted prior to starting up the reactor anyway...." Thomas stressed that this would shorten the schedule for low-power testing by about 35 days. He added, "...every day this project is delayed [it] costs more than $1 million. We have an obligation to prevent delays, and conducting these tests now will do that effectively and safely."

B&W to supply project with two mass-burning refuse boilers

● Babcock & Wilcox (B&W) has received a $20-million contract to supply a refuse-to-energy system, including two mass-burning refuse boilers, for a waste-to-energy power project in Austin, TX. The company said each unit is designed to burn 432 tons of unprocessed refuse per day and that the only necessary fuel preparation involves removal of large, non-combustible items. According to B&W, steam from the two boilers will generate 20 MW of electricity for the city. The company expects commercial operation of the facility to begin early in 1989.

Rossin sworn in as Nuclear Energy Assistant Secretary

● According to the U.S. Department of Energy, Dr. A. David Rossin has been sworn in as assistant secretary for Nuclear Energy. Rossin's April 18 nomination by President Reagan was confirmed by the Senate in mid-August. In his new position, Rossin will serve as principal nuclear energy policy advisor to the Secretary of Energy and as a key administration spokesman on the issue. For the last four and a half years, Rossin directed the Nuclear Safety Analysis Center at the Electric Power Research Institute in Palo Alto, CA.

C-E receives $23 million hydro contract

● Combustion Engineering, Inc. (C-E) said it has been awarded a $23 million contract to provide a turnkey hydroelectric generating plant for Miller Hydro Group's Worumbo Project in Lisbon Falls, ME. Under the contract, C-E will supply the design, equipment, construction, project management and start-up for the 14.8 MW plant. Operation and maintenance service will be provided by the company under a separate contract, according to C-E.

PSC refuses to rehear PNM's holding company request

● The New Mexico Public Service Commission (PSC) said it denied Public Service Co. of New Mexico's (PNM) request to rehear its proposal to reorganize as a holding company. The commission rejected the holding company proposal in July and in August the company asked the commission to rehear the proposal. The PSC, however, stated that PNM "...may develop new restructuring proposals in the future...[which]...provide PNM with additional flexibility for its diversification activities without impairing the commission's ability to carry out its statutory mandates." PNM Senior Vice President and Chief Financial Officer A.J. Robison said in response, "PNM will continue its holding company efforts because of the commission's statements and because the holding company structure offers substantial benefits to shareholders, customers and New Mexico's economic development."

Green Mountain Power's $1 million rate reduction approved

● Green Mountain Power Corp. (GMP) said that its request for a $1 million rate reduction has been approved by the Vermont Public Service Board. According to President and Chief Executive Officer John V. Cleary, Jr., the utility has reached a settlement with the Department of Public Service to withdraw a pending 6.7 percent (or $6.3 million) rate increase, as well as to reduce the existing rates. "This is the first time since the 1960's that GMP has asked to reduce basic rates," stated Cleary, "We are able to seek the rate reduction because of favorable power sales we have made to other New England utilities and because our other operating costs, principally power supply expenses, have gone down.

California PUC lowers PG&E's rates again

● The California Public Utilities Commission said it further reduced Pacific Gas and Electric Co.'s (PG&E) electric rates by $343.1 million, bringing the utility's total amount of decreases to $703 million. In June, the commission granted PG&E an interim rate reduction of $360 million. The utility had originally requested an $887 million rate reduction.

AP&L anticipates tax law changes, asks for rate cut

● Arkansas Power & Light Co. said it is requesting a rate reduction from the Arkansas Public Service Commission to reflect the expected corporate income tax law changes now under consideration by Congress. "By recognizing these benefits now," stated AP&L President Jerry L. Maulden, "we can reduce our present rates $15 million and also offset a planned $45 million increase related to Grand Gulf...a total customer benefit of $60 million." It is anticipated that the new tax law, which will become effective next year, will lower corporate income tax rates from the present 46% level, according to the utility. "We wanted our customers to get the benefit now," said Maulden.

Electric supply shortfall possible, says Harvard study

CAMBRIDGE, MA—If electricity growth holds steady at a 3.5 percent annual rate through 1993, a group of Harvard researchers believes the nation could experience a supply shortfall of 70 GW by 1993.

Joseph P. Kalt, Henry Lee, and James T. Hamilton of Harvard's Kennedy School of Government reviewed assumptions and conclusions from previous studies of electric supply adequacy.

"At a national level," they said in the report, "there is reasonable cause for concern about the ability of the power industry to satisfy electricity demand in the 1990s without incurring shortages, price increases above and beyond those predicted, or other severe measures to limit demand."

The Harvard researchers examined the National Electric Reliability Council's nine regions and projected the adequacy of capacity for each under four different scenarios. (See table.)

High reserve margins and low reserve margins were used with forecasts from NERC and the Department of Energy. In the high reserve margin case, discretionary capacity is assumed to be built. In the low reserve margin scenario, discretionary capacity is abandoned. The authors define discretionary capacity as coal plants which are planned but not built and nuclear units which are less than one-third completed.

To guarantee margins

"Most regions of the country will have to begin bringing discretionary capacity on-line during the next four years in order to guarantee adequate reserve margins during the early 1990s," concluded the report.

Using a reserve margin of 20 percent as a point for determining adequacy, the authors said Texas, California, southern Nevada and the Upper Midwest face the possibility of sharp price increases or shortages even under conditions of low demand growth and optimistic capacity expansion.

If capacity not added

If the extra capacity is not added, the report says those areas will be joined by Louisiana, Arkansas, Oklahoma, Kansas, western Missouri, and western Mississippi as states with severe capacity problems.

The study found that the Pacific Northwest has a significant supply of electricity and the Northeast's situation is "manageable."

New central station capacity will not have to be the only solution to a supply shortage, according to the report.

"Power plant conversion and refurbishment, improved and expanded interregional transmission, imported power, and decentralized power production (such as cogeneration), can make a substantial contribution to avoiding any shortfall," noted the authors. "DOE finds that there is a realistic potential that these sources will account for 60 GW of power by the year 2000."

Even with a high growth-low construction scenario, the study said blackouts and brownouts would not necessarily be the result. The Harvard researchers suggested that electric prices might be increased to dampen demand.

Looking beyond the 1990s, the study says the usefulness of forecasts declines because of increasing uncertainty.

For the longer term, the report says the relevant question is: "Will economic and regulatory conditions permit required investments in electric generating capacity to be made—on time and at the lowest feasible cost?"

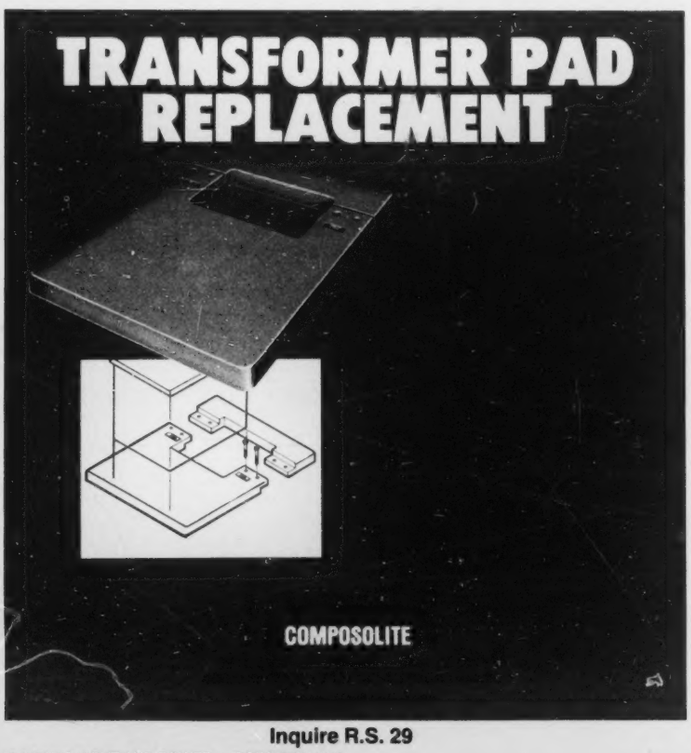
The authors made several policy

Continued on page 13

SUMMARY OF REGIONAL RESERVE MARGINS: 1993

Region	NERC Demand High R.M.	NERC Demand Low R.M.	DOE Demand High R.M.	DOE Demand Low R.M.
ECAR (OH, KY, WV, IN, w. PA, w. VA, w. MD, MI)	31.6%	31.2%	13.0%	12.7%
ERCOT (TX)	17.1	4.1	8.0	-4.0
MAAC (NJ, e. PA, e. MD, DE)	30.7	26.1	19.7	15.5
MAIN (IL, e. MO, e. WI, n. MI)	24.4	24.4	10.6	10.6
MAPP (MN, IA, ND, SD, NE, e. MN, w. WI)	16.6	7.7	7.3	-0.8
NPCC (NY, New England)	30.9	28.3	15.2	12.9
SERC (NC, e. MS, SC, AL, GA, TN, e. VA)	25.0	21.6	6.4	3.5
SPP (LA, w. MS, AR, OK, w. MO, KS)	22.0	12.3	10.8	2.1
WSCC-NW (WA, OR, w. WY, w. MT, ID, n. NV)	69.7	68.4	55.9	54.6
WSCC-Mts. (UT, CO, e. WY)	41.9	28.7	13.5	2.9
WSCC-SW (NM, AZ)	38.9	34.1	10.1	6.3
WSCC (CA, s. NV)	11.6	8.3	1.1	-1.9

R.M. = Reserve Margin.
High R.M. = Reserve Margin with construction of discretionary capacity.
Low R.M. = Reserve Margin without construction of discretionary capacity.
Source: "A Review of the Adequacy of Electric Power Generating Capacity in the U.S.," Kalt, Lee & Hamilton.



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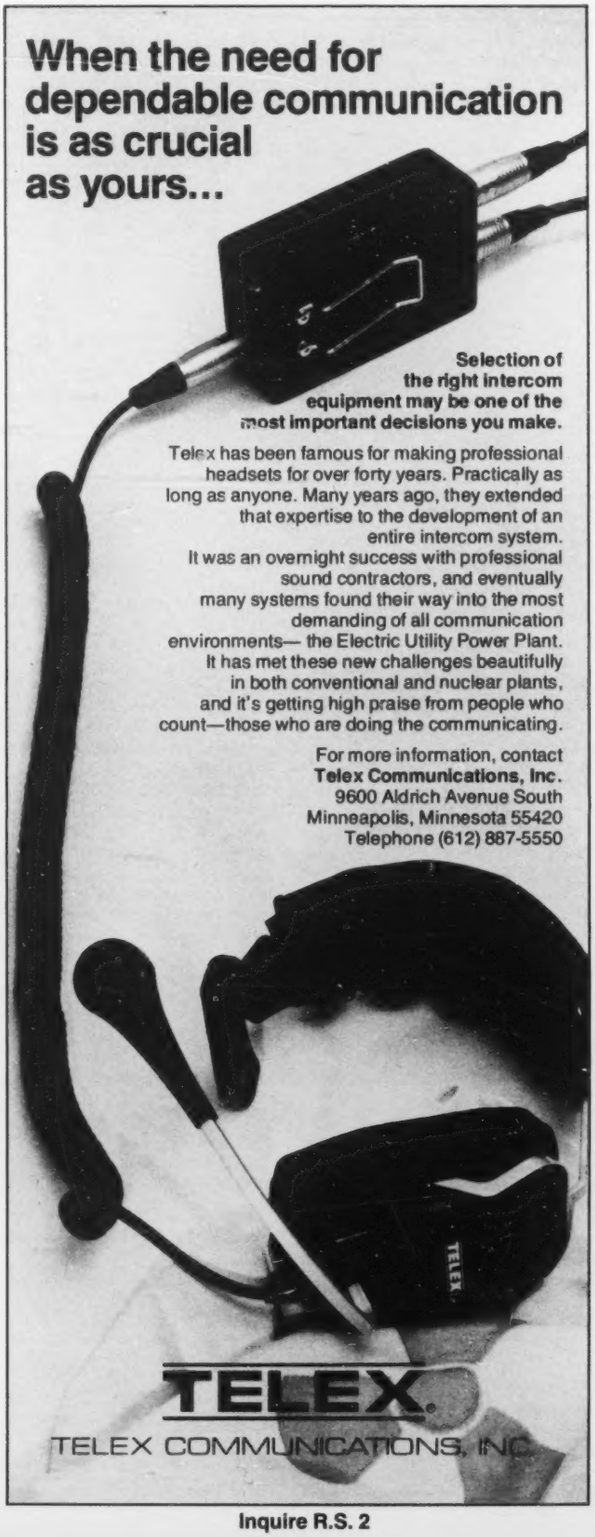
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Inquire R.S. 2

Editorial

U.S. utilities need U.S.-made equipment

Could the U.S. electric utility industry be on the verge of losing control of its own future? Could the nature and pace of technological development be dictated by outsiders? What absurd ideas! Or are they?

Ten years ago, only a handful of offshore apparatus manufacturers plied their wares among American utilities. The fragile nature of international dependence had been made abundantly clear by the Arab oil embargo. Most U.S. utilities had little desire to be dependent on offshore sources for essential equipment or services.

But times changed, and memories faded. Offshore suppliers, lured by the potential of the world's largest national market for heavy electrical equipment, found U.S. utilities less adamant about reliance on domestic suppliers only. Major offshore manufacturers, such as ASEA, Brown Boveri, Siemens, and Toshiba, to name only four, sought affiliations with existing domestic suppliers, to ease their entrance into the American market or to enhance their presence.

Still, as recently as 1984, only a handful of non-domestic manufacturers of electrical equipment and apparatus exhibited at the IEEE T&D Exposition. But by the next T&D Conference and Exposition, held last month, foreign exhibitors numbered in the dozens. Still, U.S. utilities are calling the shots as to what they will or will not install on their future systems.

But there has been a fundamental change in the way equipment and apparatus is purchased. Ony a few years ago product quality, reserve operating capacities, safety margins, and long life expectancy were prime criteria. Now, primary emphasis has shifted again to bottom line price. The effect of this change in emphasis could have a long term impact on the reliable operation of U.S. power systems for years to come.

A major concern among many manufacturers of T&D equipment at the IEEE Show was the possible effects of this shift away from buying quality and what it will mean. Even executives of U.S. subsidiaries of offshore companies, who manufacture in the U.S., see dangers resulting from the shift to greater price buying.

Over time, they suggest, emphasis on price favors either manufacturers with cheap labor supplies, or those companies who are able to invest large amounts of money to upgrade manufacturing facilities to be more productive. As price competition increases, profitability declines, and reinvestment in plant becomes more difficult or impossible. And since the U.S. is a high-cost labor market, this works against domestic manufacturers. The result can be the shift of manufacturing to offshore sources and the loss of hundreds of thousands of U.S. jobs. U.S. facilities could be used for assembly and test only, as has already happened in the power circuit breaker field.

The electric utility industry, which over the years has worked closely with its domestic equipment manufacturing allies, could find itself far removed from its sources of product development. With such a loss the entire nation could find its industrial base at risk.

To be perfectly clear, we are not against the participation of offshore suppliers in the U.S. market. We welcome the imagination and creativity they bring to the solution of electric utility problems in this country. But we must strongly support domestic production by those offshore suppliers.

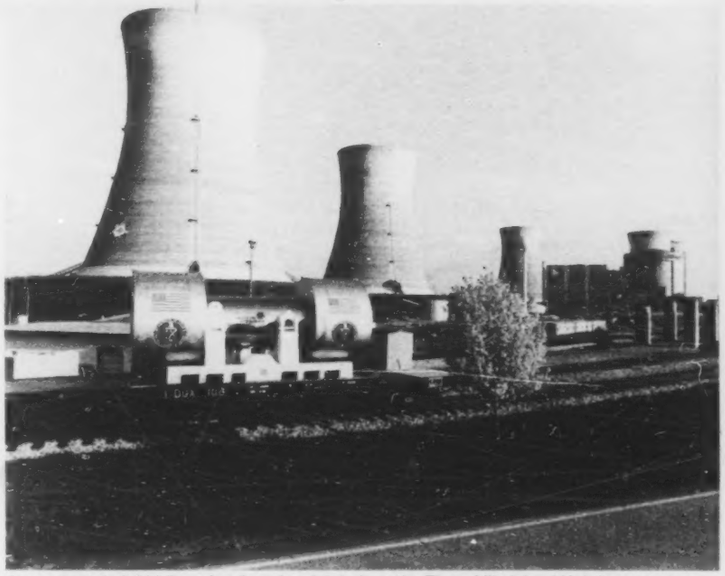
Utilities must, therefore, return to making purchasing decisions based more on the quality of the equipment at fair and reasonable prices, not always pushing for the lowest price. Our electric power supply is too essential to the economy and to the strength of the nation to ever allow it to become dependent on non-domestic sources for the equiment necessary to its production. But this is exactly what can happen if utility buyers continue to put their major emphasis on lowest prices.

We all smiled at that funny little German car that was introduced in the United States in the 1950s; after all, who would buy a foreign automobile? And we recall the hoots of derision when the suggestion was made that the United States was losing its basic steel industry. Now, we are all aware of how serious offshore suppliers are and how competent they can be at meeting market needs.

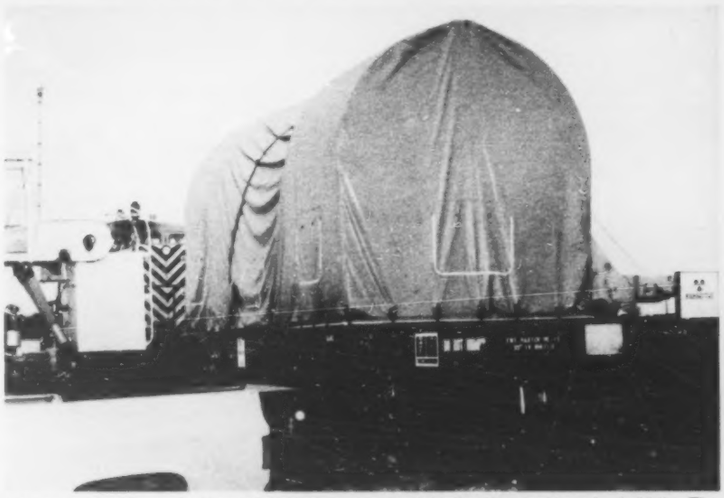
Will we see increasing shifts to equipment manufactured offshore? It all depends on what utility buyers are willing to do in the next five to ten years. And that time begins now.

Robert A. Lincicome, Editor-in-Chief

First of TMI-2 debris arrives safely in Idaho



Approximately 2,000 lbs. of radioactive debris from the Three Mile Island Unit 2 reactor leaves Pennsylvania in mid-July (R.) headed for the Idaho National Engineering Laboratory.



Lab spokesman Terry Smith said it took about one week for the shipment to arrive in Idaho. The debris is being shipped in two lead and steel casks that are 23 ft long and 10 ft in diameter. Smith said future shipments will average 10,000 lbs. of debris. He estimates that 35 to 40 more loads will be carried to Idaho over the next two and a half years by Conrail and Union Pacific Railroad. Each cask holds specially-designed defueling canisters that are 12 ft long, 14 inches in diameter and hold as much as 1,500 lbs. of debris.

August 1986 Top 100 story correction

In our August 1986 "Top 100 Operating Performance" story (p.17) it was incorrectly reported that Orange & Rockland's gas consumption declined in 1985. The company's consumption of natural gas increased in 1985 by 28 percent compared to 1984.

Interstate Power Company's circuit miles of transmission line below 189-kV should have been reported as 2,568 miles, a 36 mile reduction over the previous year.

Electric Light & Power

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Mountaineer coal-fired plant breaking records for continuous run

NEW HAVEN, WV—Appalachian Power Company's 1,300 MW Mountaineer coal plant is headed toward another world record for continuous operation of a steam electric generating unit.

On July 14 the plant completed 365 consecutive days of continuous operation and has been running ever since.

Breaking the mark

At press time in mid-September, the plant was setting a new record every day and was headed toward breaking the mark for a large-sized steam electric unit. That record of 439 days is held by Duke Power Company's Oconee Unit 2 nuclear plant. An AEP spokesman said that the Mountaineer plant will have run 440 consecutive days on Sept. 27.

Previously, the record for continuous operation by a major coal-fired station was set last March by Monongahela Power Company's Harrison plant, which operated for 346 days.

Appalachian Power is one of eight operating companies in the seven-state American Electric Power system.

Only seven similar units

The Mountaineer unit is one of five 1,300 MW units operated by AEP. Only seven 1,300 MW fossil units are in service in the world, all of which use boilers manufactured by Babcock & Wilcox Company.

Since commercial operation in 1980, Mountaineer has had an average unit availability of more than 90 percent, including 97 percent in 1981, 97.6 percent in 1984, and 100 percent to date in 1986.

DOE's Hesse named chairwoman of the Federal Energy Regulatory Commission

WASHINGTON—President Reagan recently announced the nomination of Martha A. Hesse to chairwoman of the Federal Energy Regulatory Commission.

Awaiting confirmation

She replaces former chairman Raymond J. O'Connor, who left before completing his term. Her term expires Oct. 20, 1987. Hesse was awaiting Senate confirmation at press time.

Martha O. Hesse

Hesse has been the Department of Energy's Assistant Secretary for Management and Administration. In her position she has direct or oversight responsiblities for $22 billion a year and 135,000 government or contractor employees.

Background

Before joining DOE in Dec. 1982, Hesse was Executive Director of the President's Task Force on Management Reform. Previously she served as Associate Deputy Secretary of Commerce.

Hesse attended the University of Iowa, majoring in psychology, and received an MBA (The Executive Program) from the University of Chicago in 1979.

Electric supply . . .
from page 3

recommendations in their report:

1. Investor rates of return should not be held below the cost of capital.
2. Investors should not be guaranteed that they will never lose money on their capacity decisions. Rather, investments should be governed by standards of "used and useful."
3. Utility commissions should avoid technological bias arising from prejudgments about the feasibility of particular generation technologies.
4. Electricity should be wheeled and transported at every opportunity to insure that capacity is fully used and allocated to its highest valued uses.
5. Regulatory impediments that protect monopolistic practices in power transportation should be eliminated.
6. Obstacles and penalties to third-party electricity sales should be removed.

For copies

Copies of *A Review of the Adequacy of Electric Power Generating Capacity in the U.S., 1985-93 and 1993-Beyond* can be obtained by contacting the Energy & Environmental Policy Center at the John F. Kennedy School of Government, (617) 495-1357.

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Inquire R.S. 7

Wind power now an option for utilities, says EPRI

PALO ALTO, CA—Smaller wind power turbines have advanced enough that electric utilities should begin looking at them as a generating option now and in the future, according to the Electric Power Research Institute.

In a recent *Technical Brief* update on wind power, EPRI said, "Small wind turbine technology has progressed to the point where the utility industry can factor wind power into its long-range generation expansion plans and take early steps to prepare for use of wind power."

By the end of 1985, more than 13,000 machines had been installed in California. (See chart) EPRI said advantages of the smaller turbines include design simplicity, ease of installation and repair, and rapid reliability maturation.

The aggregate rating of the installed turbines is estimated to be 1.1 GW. EPRI said the availability of individual units in the leading commercial wind stations has trended to 0.95 and has held at that level for two years.

Costs are falling

According to the update, operating and maintenance costs have continued to fall and appear to be trending to approximately one cent per kWh for large mature wind power stations. Installed costs for wind power stations have fallen dramatically and are now ranging from $1200 to $1900 per kW.

"In general," stated the report, "wind power stations using the smaller machines look very attractive as a future utility generation option."

Several trends in the industry were pointed out by the institute:

- Reliability has risen and costs are falling. The primary technical uncertainty remaining is long-term wear life of major components.
- Turbine prices have fallen sharply.
- Installed turbine ratings have risen from 50-kW to about 100-kW on the average.

Also, EPRI said leading developers now understand the benefits of centralized monitoring, control, and data acquisition which can be provided if their machines are deployed in more fully integrated wind stations.

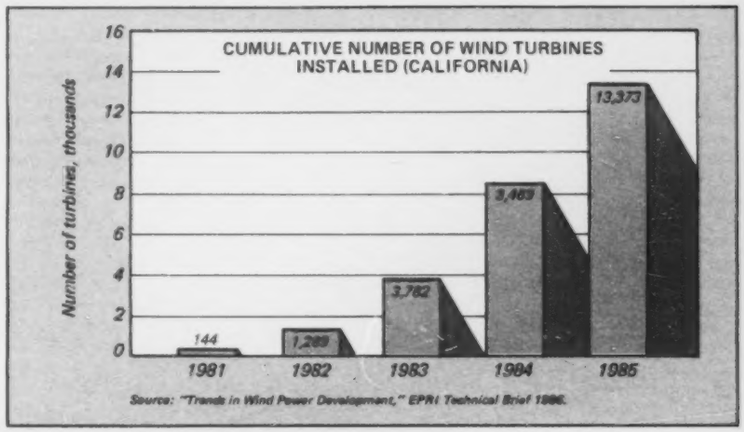
"Increased competitiveness," said the update, "along with changes in tax incentives, is causing a wind power industry consolidation from which a smaller industry composed of more stable and well-rounded players is likely to emerge."

Although small wind turbine technology is maturing, EPRI said the experimental multi-megawatt wind turbines continue to show poor reliability maturation and low availabilities, because of size, complexity and logistic requirements.

Noted the update, "Long downtimes associated with failures slowed maturation of the technology. Questions regarding practicality of use and size of market surfaced, which in turn made it doubtful that the production volumes upon which early cost estimates were based would ever be reached."

EPRI believes the majority of the wind power industry feel that it is more cost-effective to evolve wind technology from the bottum up.

"In other words," notes the report, "the small machine technology can be pushed up to larger sizes rather than trying to streamline the multi-megawatt machines."



Biofouling . . .
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stream pipe elbow.

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The study concluded that both the fixed-nozzle system enhanced by upstream guide vanes and the movable diffuser manifold offer potentially feasible options for targeted chlorination. The Tennessee Valley Authority (TVA) has successfully demonstrated the manifold diffuser concept at its Kingston station. EPRI will demonstrate the fixed nozzle technique in full-scale testing this year at Unit 1 of New England Electric System's Brayton Point station.

Data from a second TVA guild study on movable manifolds, conducted at Unit 1 of the John Sevier power plant, now is being evaluated by EPRI. Future work includes testing to better define optimum chlorination dosage, concentration and frequency.

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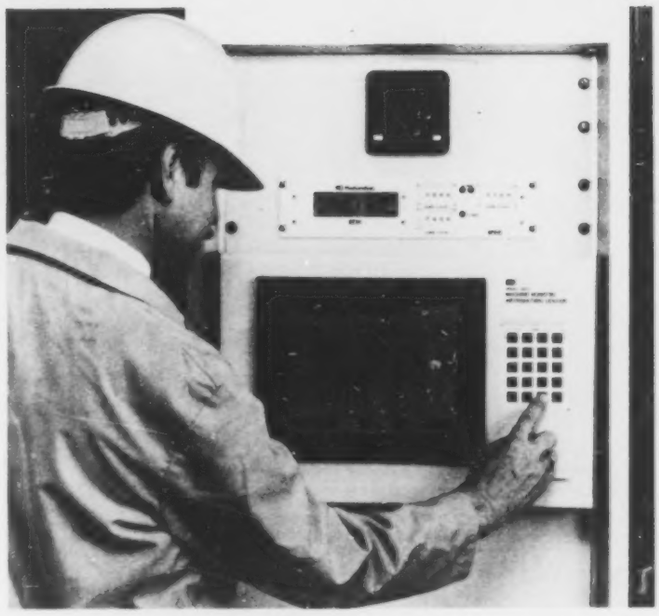

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